February 5, 2020

VIA ELECTRONIC FILING

Ms. Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: ***Ex Parte*** **Presentation,** *Unlicensed Use of the 6 GHz Band*, ET Docket No. 18-295; *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, GN Docket No. 17-183

Dear Ms. Dortch:

On February 3, 2020 and February 4, 2020, CTIA and member company representatives ("participants") met separately with Bill Davenport of the Office of Commissioner Geoffrey Starks and Will Adams of the Office of Commissioner Brendan Carr to discuss the 6 GHz proceeding. The full list of meeting participants is attached. Participants provided further evidence of how untethered, low power indoor ("LPI") devices will cause harmful interference to Fixed Service operations in the band and urged the Commission to issue a Further Notice of Proposed Rulemaking to consider licensing the upper portion of the band.

During the meetings, the participants made the following points related to incumbent protections in the 6 GHz band:

- The RLAN studies fail to show that LPI devices will avoid causing harmful interference, if operated without Automatic Frequency Coordination ("AFC"), in a band that has nearly 100,000 incumbent operations;
- A review of five real-world examples pulled from the first 25 entries in a Universal Licensing System search of 6 GHz licenses shows that, if LPI devices are operated in homes, businesses, and government buildings nearby, and in line-of-sight with,

incumbent operations, there is an overwhelming likelihood they will cause harmful interference absent positive control like AFC;[1] and

- The Commission should reject RLAN stakeholders' unsupported cost and complexity concerns in determining whether to require AFC for LPI devices.

CTIA also urged the Commission to explore additional opportunities to make mid-band spectrum available on an exclusive, flexible-use licensed basis as quickly as possible.[2] A recent report shows that in 13 benchmark countries, nearly all spectrum repurposed from 2017 to 2020 has been made available via exclusive-use licensing. Yet, in the United States, unlicensed/dynamic sharing is far more prevalent, including in the mid-band range.[3] The FCC's proposal to open the entire 1,200 megahertz of 6 GHz spectrum for unlicensed use stands in stark contrast to the European Union, where nations are taking steps to make only the lower 600 megahertz available for unlicensed use.[4] The FCC should take a balanced approach to the 6 GHz band that opens the lower portion of the band for unlicensed use while exploring the opportunity to repurpose the upper portion of the band for exclusive, flexible-use licensing.

Pursuant to Section 1.1206 of the Commission's rules, this notice is being filed in ECFS and provided to the Commission meeting attendees.

Sincerely,

/s/ Jennifer L. Oberhausen
Jennifer L. Oberhausen
Director, Regulatory Affairs

Attachments

[1] The presentation is attached. *See also* Letter from CTIA to FCC, ET Docket No. 18-295 (filed Jan. 24, 2020).

[2] *See* Letter from CTIA to FCC, ET Docket No. 18-295 (filed Feb. 3, 2020).

[3] David Abecassis, Janette Stewart, and Chris Nickerson, *International Comparison: Licensed, Unlicensed, and Shared Spectrum, 2017-2020*, ANALYSYS MASON (Jan. 2020), https://api.ctia.org/wp-content/uploads/2020/02/report-International-Comparison-Licensed-Unlicensed-and-Shared-Spectrum-2017-2020.pdf.pdf.

[4] *Id*.

February 3-4, 2020 Meeting Attendees

Meeting with Bill Davenport, Office of Commissioner Starks

CTIA
Scott Bergmann
Jennifer Oberhausen
Doug Hyslop
Adam Krinsky, Wilkinson Barker Knauer, LLP
Mark Settle, Wilkinson Barker Knauer, LLP

AT&T
Neeti Tandon

Ericsson
Jared Carlson

US Cellular
Grant Spellmeyer

Verizon
Patrick Welsh
Daudeline Meme

Meeting with Will Adams, Office of Commissioner Carr

CTIA
Scott Bergmann
Jennifer Oberhausen
Adam Krinsky, Wilkinson Barker Knauer, LLP
Mark Settle, Wilkinson Barker Knauer, LLP

Ericsson
Matthew Hussey

Sprint
Gardner Foster

Verizon
Will Johnson
Tamara Preiss

ctia™ Everything Wireless™

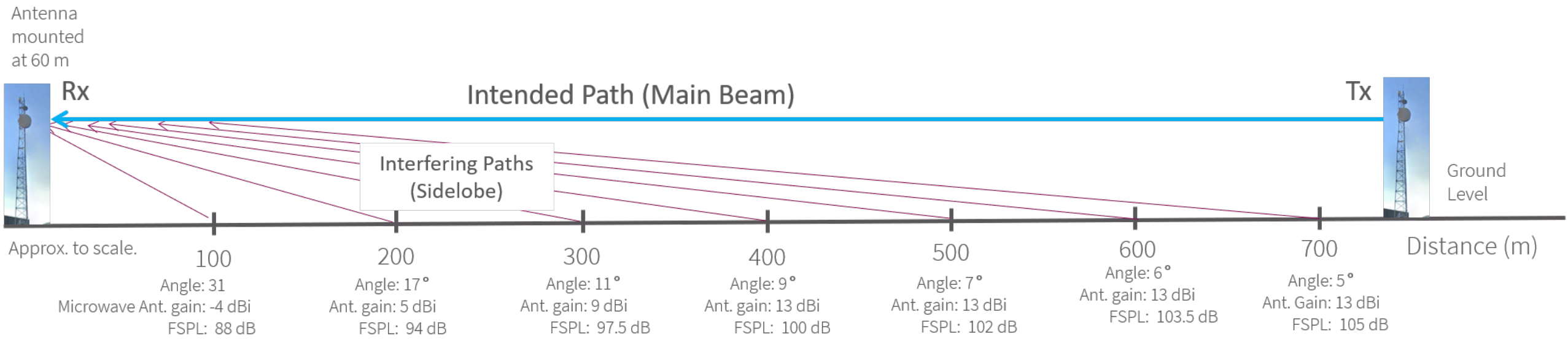
6 GHz Interference Analysis

January 2020

The Risk of Low Power Indoor Devices Causing Harmful Interference to FS Links is Profound

- The evidence soundly rejects the RLAN arguments in support of non-AFC low power indoor (LPI) devices.
- Below we review five cases pulled from the first 25 entries in a ULS 6 GHz license search, which show the interference effects that LPI devices will cause.
- Without AFC, interference into an FS antenna sidelobe will result from common scenarios involving LPI devices operating:
  - Within homes, enterprise settings, and government buildings (whether built with traditional construction or thermally efficient construction), and
  - Near to and within line-of-sight of FS receive facilities.
- Each example shows VERY high probability that a single LPI device will cause harmful interference — between 76-97% likelihood of interference greater than -6 dB I/N.
  - Multiple LPI devices will only aggravate the interference scenario.

Sidelobe Interference is as Important as the Main Beam



FSPL Calculations performed at 6 GHz using horizontal separation (i.e., not slant range)
FS antenna gain and suppression based on §101.115

- A single nearby device transmitting in the antenna sidelobes will cause harmful interference.
- While antenna discrimination increases as the interfering transmitter gets closer to the FS antenna, lower propagation losses offset the change in antenna gain.
  - In the example above, antenna gain decreases from 13 dBi at 700 meters, to -4 dBi at 100 meters, a total reduction of 17 dB, while path loss decreases from 105 dB at 700 meters to 88 dB at 100 meters, a total reduction of 17 dB
- The impact of a nearby device in the sidelobe is the same or greater than a further-away device closer to the main beam.

Examples of Short-Range Sidelobe Interference from LPI Devices

The Interference Calculation Used Here Relies on FCC Rules, ULS Data, and RLAN Assumptions Modified by CTIA's (Still Unrefuted) Points

- Interference is assessed by a link budget analysis:

$$I = P_{EIRP} + G_R - L_{ANT} - L_P - BEL$$

- I = Interference Level (dBm/Hz)
- P_{EIRP} = RLAN Radiated Power (+30 dBm EIRP in 160 MHz channel)+
  - RLAN proposed radiated power level for LPI device operations. HPE proposed to reduce emissions in the horizontal distance (December 12, 2019 HPE ex parte) but did not identify a specific level of suppression, or how to ensure antennas are installed horizontally. In addition, it is highly unlikely that enough suppression can be achieved through a simple elevation mask to prevent harmful interference.
  - The RLAN parties have claimed that RLAN antennas do not exhibit significant gain towards the horizon (Dec. 23, 2019 *ex parte*) and thus the EIRP should be reduced. However, as discussed in prior CTIA filings (Nov. 15, 2019 *ex parte*) many RLAN antennas will be hinged and cannot be guaranteed to be installed in any specific orientation.
- G_R = Fixed Service (FS) Antenna Gain
  - Taken from individual license files in ULS (dBi)
- L_{ANT} = Antenna Off-Axis Suppression
  - Based on 47 C.F.R. § 101.115 (dB)
- L_P = Free Space Path Loss
  - RLAN stakeholders have acknowledged that free space conditions exist at line-of-sight scenarios near the FS receiver (July 2, 2019 RLAN ex parte). As shown in the photos, these cases involve no clutter, no foliage, and no terrain to obstruct the signal.
- BEL = Building Entry Loss
  - As CTIA has previously described, and in contrast to the RLAN showings (including Charter's December 13, 2019 ex parte), ITU-R Recommendation P.2109-1 requires that any analysis apply the full distribution of building entry loss (BEL) values. As shown in the graphs, this results in a curve and not a single number.

+ The analysis uses a 160 MHz bandwidth for RLAN channelization, but each time the bandwidth is cut in half (e.g., to 80, 40, 20 MHz) the interference potential doubles (i.e., by +3, +6, +9 dB respectively).

Interference to Noise (I/N) Calculation

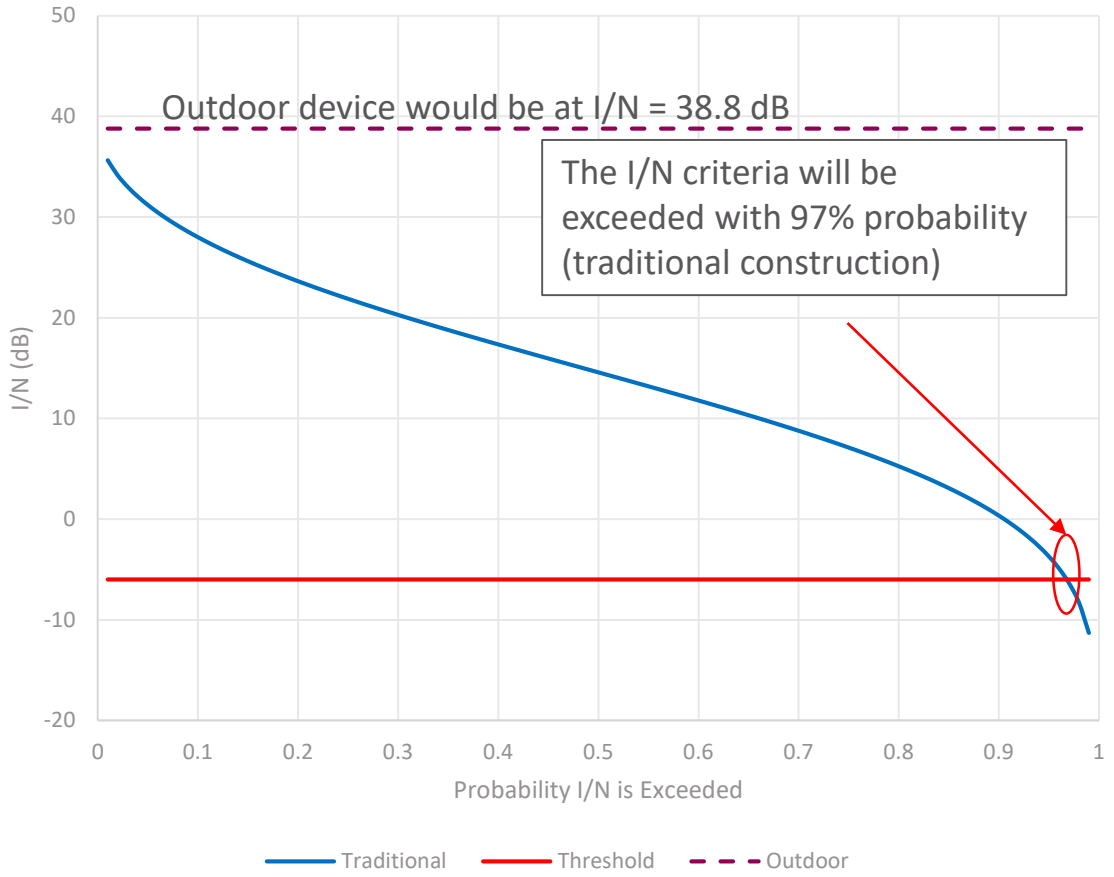
- N = Nthermal (kTB) + NoiseFigure(assume 3 dB)[+] = -171 dBm/Hz
  - 3 dB Noise Figure is a reasonable assumption
- I/N = I – N
  - I and N are both calculated on a per Hertz basis, so no further bandwidth conversion is necessary
- I/N threshold for harmful interference is I/N = -6 dB, as expressed by the RLAN parties and many incumbents (*See* UTC ex parte November 21, 2019; FWCC ex parte on November 21, 2019; RLAN Parties November 12, 2019 ex parte; HPE and Federated Wireless October 3, 2019 ex parte)
- In the charts below, everything above the red threshold line is at an I/N greater than -6 dB and should be considered harmful interference

+ Other parties have advocated for using a noise figure plus 2 dB of feeder loss. This small additional loss would not significantly change the analysis results.

KAN32 – Colorado

KAN32 Interference Calculation

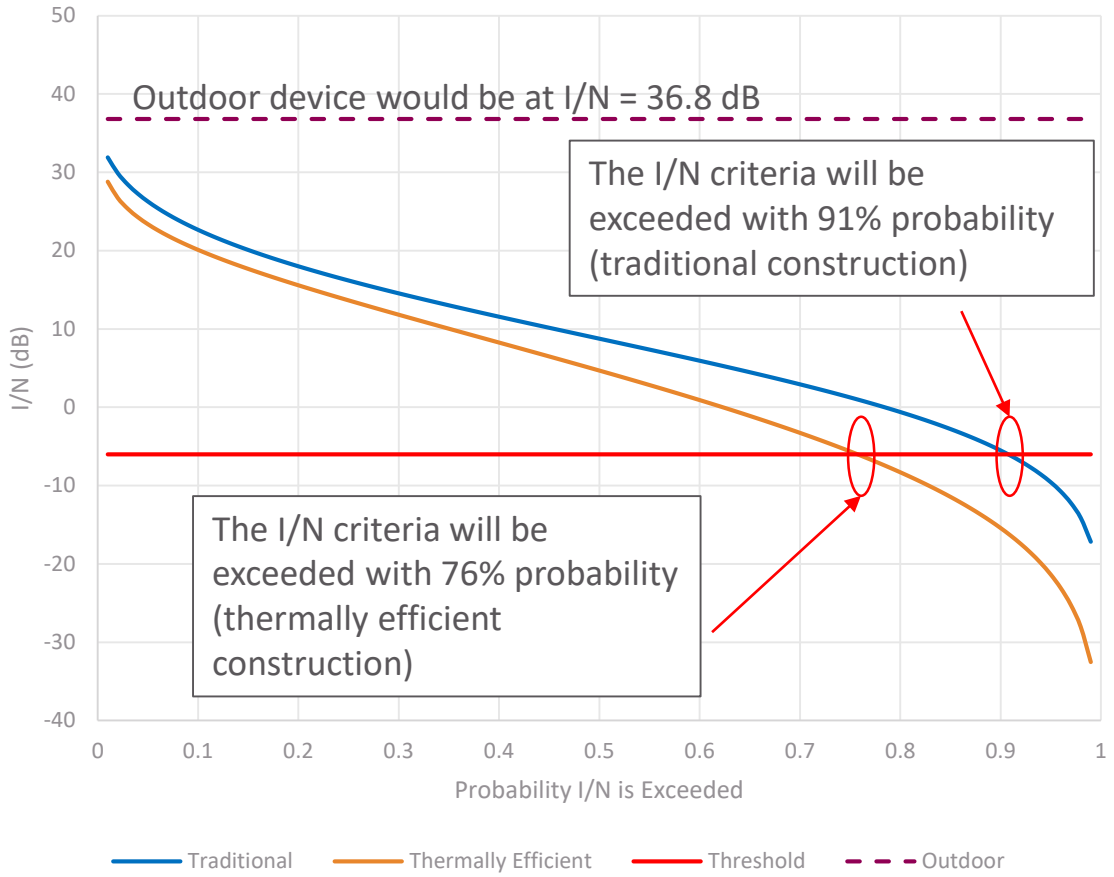
- $I = P_{(EIRP)} + G_R - L_{ANT} - L_P - BEL$
  - $P_{(EIRP)}$ = -52 dBm/Hz
  - Lp = FSPL (f=6 GHz, d = 56.4m) = 83 dB
  - FS Antenna Gain (from ULS) = 44.8 dBi
  - Off-Axis Suppression (from §101.115) = 42 dB
  - BEL is calculated from ITU-R P.2109-1 (the difference between an outdoor device and the predicted interference curve is the BEL)
- $N = N_{Thermal} + NF(assume\ 3\ dB)$ = -171 dBm/Hz
- The home in the photo suggests traditional construction methods and materials



KAX33 – South Dakota

KAX33 Interference Calculation

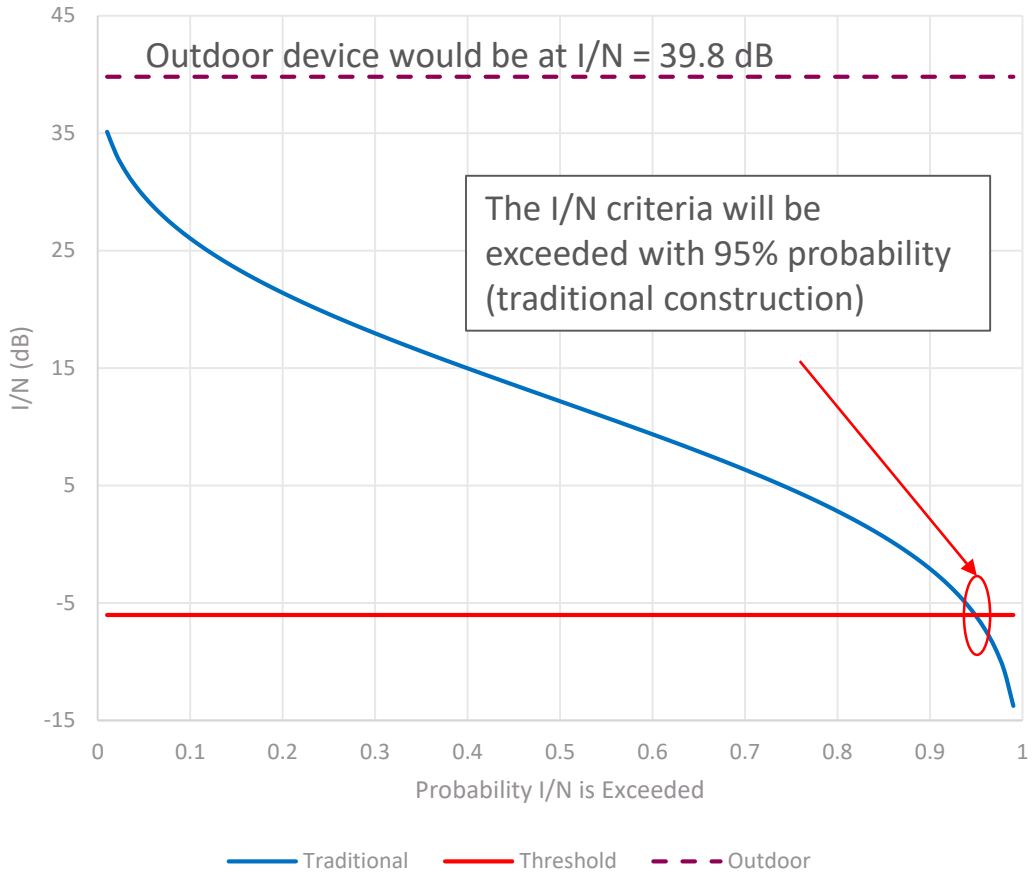
- $I = P_{(EIRP)} + G_R - L_{ANT} - L_P - BEL$
  - $P_{(EIRP)}$ = -52 dBm/Hz
  - Lp = FSPL (f=6 GHz, d = 49.6 m) = 81.9 dB
  - FS Antenna Gain (estimated from beamwidth in ULS) = 41.7 dBi
  - Off-Axis Suppression (from §101.115) = 42 dB
  - BEL is calculated from ITU-R P.2109-1 (the difference between an outdoor device and the predicted interference curve is the BEL)
- $N = N_{Thermal} + NF(assume\ 3\ dB) = -171\ dBm/Hz$
- The commercial building could suggest either traditional or thermally efficient building methods and materials



KBC41 – Colorado

KBC41 Interference Calculation

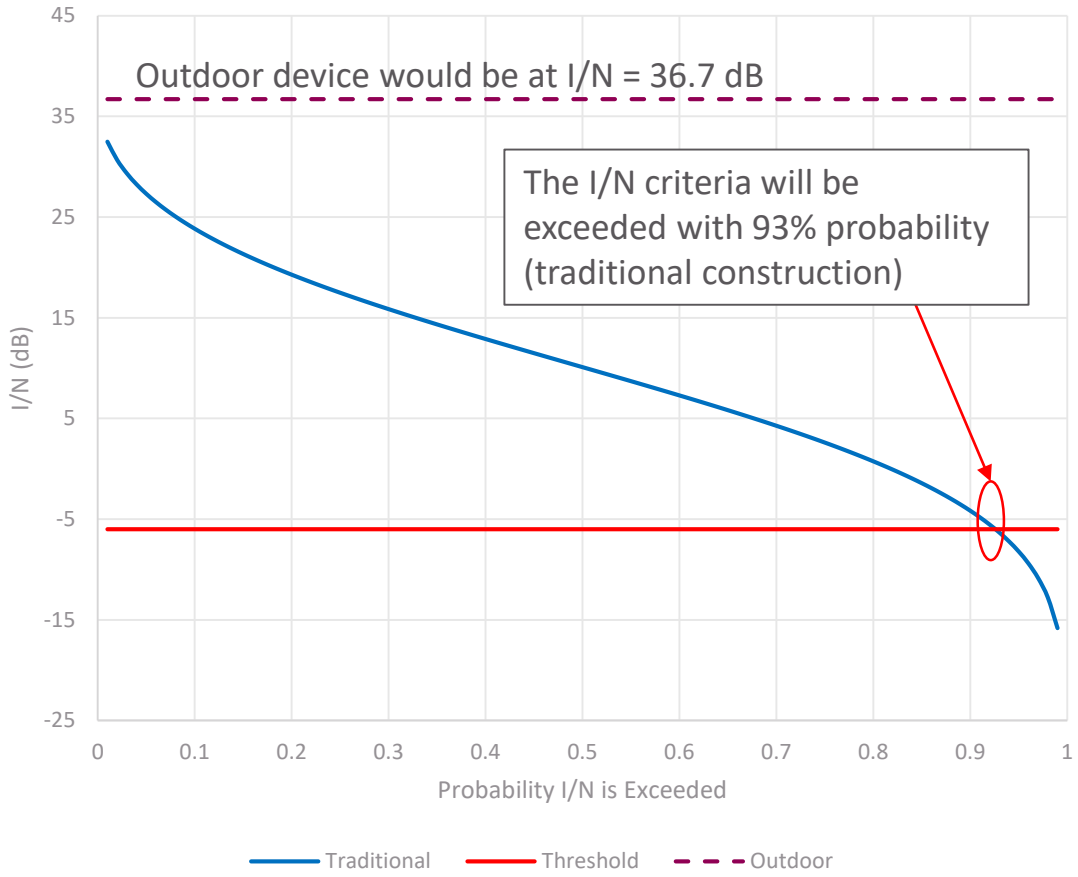
- $I = P_{(EIRP)} + G_R - L_{ANT} - L_P - BEL$
  - $P_{(EIRP)}$ = -52 dBm/Hz
  - Lp = FSPL (f=6 GHz, d = 40.8 m) = 80.2 dB
  - FS Antenna Gain (from ULS) = 43.0 dBi
  - Off-Axis Suppression (from §101.115) = 42 dB
  - BEL is calculated from ITU-R P.2109-1 (the difference between an outdoor device and the predicted interference curve is the BEL)
- $N = N_{Thermal}$ + NF(assume 3 dB) = -171 dBm/Hz
- The home in the photo suggests traditional construction methods and materials



KBI49 – Iowa

KBI49 Interference Calculation

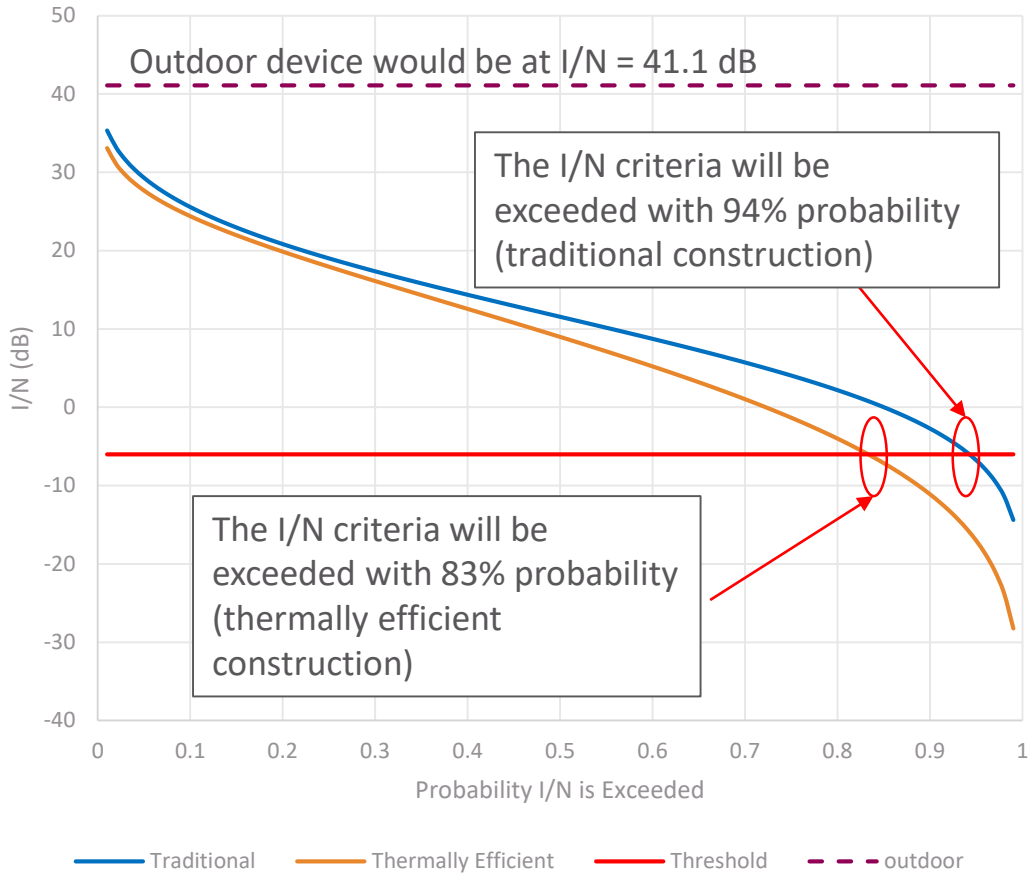
- $I = P_{(EIRP)} + G_R - L_{ANT} - L_P - BEL$
  - $P_{(EIRP)}$ = -52 dBm/Hz
  - Lp = FSPL (f=6 GHz, d = 50.3 m) = 82.0 dB
  - FS Antenna Gain (from ULS) = 41.7 dBi
  - Off-Axis Suppression (from §101.115) = 42 dB
  - BEL is calculated from ITU-R P.2109-1 (the difference between an outdoor device and the predicted interference curve is the BEL)
- $N = N_{Thermal}$ + NF(assume 3 dB) = -171 dBm/Hz
- The home in the photo suggests traditional construction methods and materials



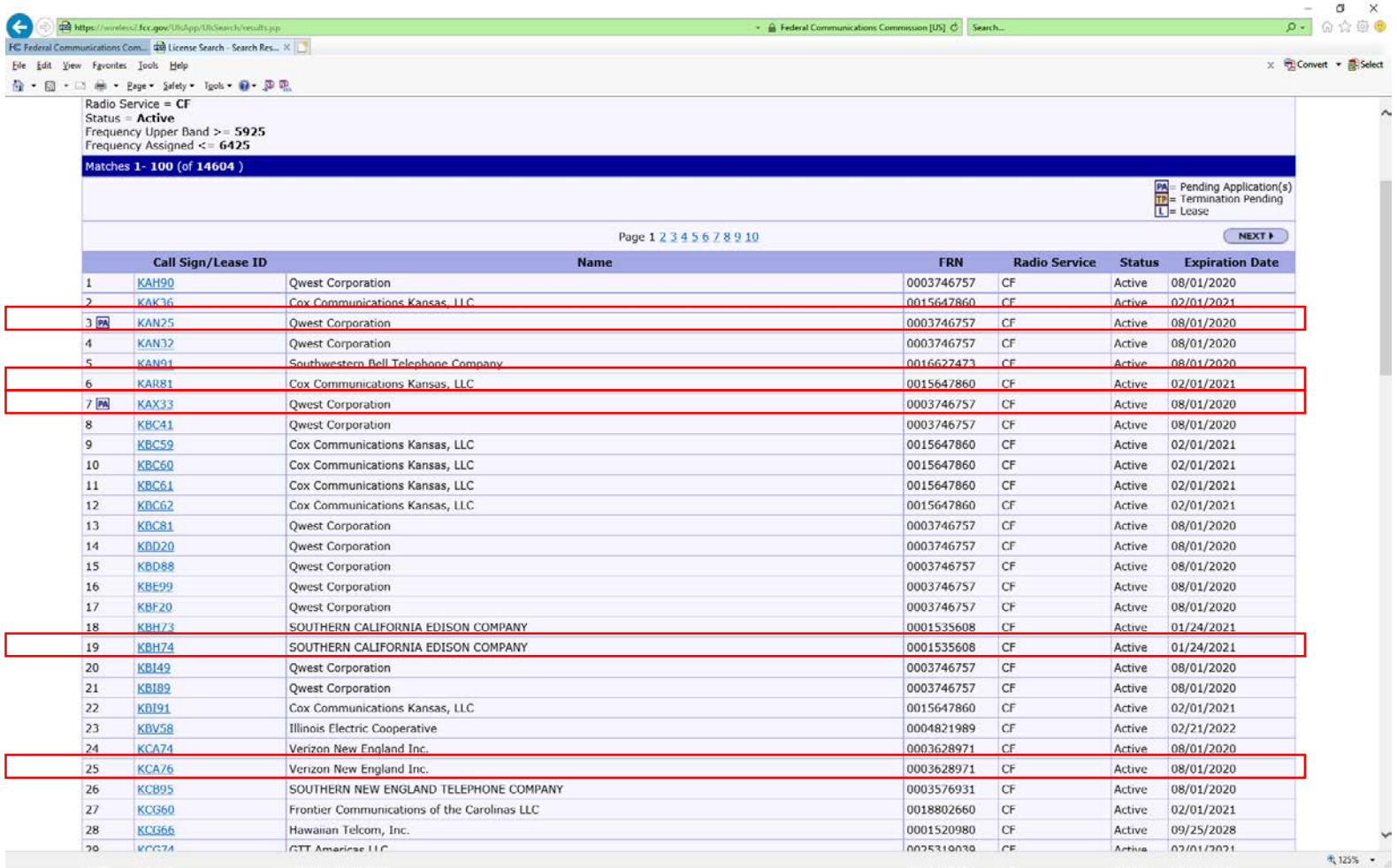
KCA76 – Massachusetts

KCA76 Interference Calculation

- $I = P_{(EIRP)} + G_R - L_{ANT} - L_P - BEL$
  - $P_{(EIRP)}$ = -52 dBm/Hz
  - Lp = FSPL (f=6 GHz, d = 36 m) = 79.1 dB
  - FS Antenna Gain (from ULS) = 43.2 dBi
  - Off-Axis Suppression (from §101.115) = 42 dB
  - BEL is calculated from ITU-R P.2109-1 (the difference between an outdoor device and the predicted interference curve is the BEL)
- $N = N_{Thermal} + NF(assume\ 3\ dB) = -171\ dBm/Hz$
- The government building could suggest either traditional or thermally efficient building methods and materials



These Five Examples Are Common Cases, Not Corner Cases, and Were Readily Found in a Basic ULS Search



Radio Service = **CF**
Status = **Active**
Frequency Upper Band >= **5925**
Frequency Assigned <= **6425**

Matches **1- 100** (of **14604**)

PA = Pending Application(s)
TP = Termination Pending
L = Lease

Page 1 2 3 4 5 6 7 8 9 10 NEXT

	Call Sign/Lease ID	Name	FRN	Radio Service	Status	Expiration Date
1	KAH90	Qwest Corporation	0003746757	CF	Active	08/01/2020
2	KAK36	Cox Communications Kansas, LLC	0015647860	CF	Active	02/01/2021
3 PA	KAN25	Qwest Corporation	0003746757	CF	Active	08/01/2020
4	KAN32	Qwest Corporation	0003746757	CF	Active	08/01/2020
5	KAN91	Southwestern Bell Telephone Company	0016627473	CF	Active	08/01/2020
6	KAR81	Cox Communications Kansas, LLC	0015647860	CF	Active	02/01/2021
7 PA	KAX33	Qwest Corporation	0003746757	CF	Active	08/01/2020
8	KBC41	Qwest Corporation	0003746757	CF	Active	08/01/2020
9	KBC59	Cox Communications Kansas, LLC	0015647860	CF	Active	02/01/2021
10	KBC60	Cox Communications Kansas, LLC	0015647860	CF	Active	02/01/2021
11	KBC61	Cox Communications Kansas, LLC	0015647860	CF	Active	02/01/2021
12	KBC62	Cox Communications Kansas, LLC	0015647860	CF	Active	02/01/2021
13	KBC81	Qwest Corporation	0003746757	CF	Active	08/01/2020
14	KBD20	Qwest Corporation	0003746757	CF	Active	08/01/2020
15	KBD88	Qwest Corporation	0003746757	CF	Active	08/01/2020
16	KBE99	Qwest Corporation	0003746757	CF	Active	08/01/2020
17	KBF20	Qwest Corporation	0003746757	CF	Active	08/01/2020
18	KBH73	SOUTHERN CALIFORNIA EDISON COMPANY	0001535608	CF	Active	01/24/2021
19	KBH74	SOUTHERN CALIFORNIA EDISON COMPANY	0001535608	CF	Active	01/24/2021
20	KBI49	Qwest Corporation	0003746757	CF	Active	08/01/2020
21	KBI89	Qwest Corporation	0003746757	CF	Active	08/01/2020
22	KBI91	Cox Communications Kansas, LLC	0015647860	CF	Active	02/01/2021
23	KBV58	Illinois Electric Cooperative	0004821989	CF	Active	02/21/2022
24	KCA74	Verizon New England Inc.	0003628971	CF	Active	08/01/2020
25	KCA76	Verizon New England Inc.	0003628971	CF	Active	08/01/2020
26	KCB95	SOUTHERN NEW ENGLAND TELEPHONE COMPANY	0003576931	CF	Active	08/01/2020
27	KCG60	Frontier Communications of the Carolinas LLC	0018802660	CF	Active	02/01/2021
28	KCG66	Hawaiian Telcom, Inc.	0001520980	CF	Active	09/25/2028
29	KCG74	GTT Americas LLC	0025319039	CF	Active	02/01/2021

- These cases were found in the first 25 results of a ULS search for common carrier fixed licenses in 5925-6425 MHz.
- Thousands of similar situations exist if one were to account for all FS licenses in the band.
- These are all primary licensees that unlicensed LPI devices must protect.

Positive AFC Control is Essential

- Each of the cases presented here indicate that, without AFC control, harmful interference will very likely result from common scenarios of sidelobe interference.
- The modeling results clearly demonstrate:
  - LPI devices will cause harmful interference to the FS even when outside of the narrow point-to-point main-beam
  - LPI devices will cause harmful interference over a non-trivial range and set of off-axis angles
  - LPI devices will cause harmful interference operating from common locations of unlicensed devices
- An AFC system will inform the device of available channels in the area and ensure power levels are appropriate to prevent interference.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